TECHNICAL REPORT

Contract Title:	Infrared Algorithm Development for Ocean Observations with EOS/MODIS
Contract:	NAS5-31361
Type of Report:	Quarterly
Time Period:	July 1994-September 1994

Principal Investigator:	Otis B. Brown RSMAS/MPO University of Miami 4600 Rickenbacker Causeway Miami, Florida 33149-1098

INFRARED ALGORITHM DEVELOPMENT FOR OCEAN OBSERVATIONS WITH EOS/MODIS

Abstract

Efforts continue under this contract to develop algorithms for the computation of sea surface temperature (SST) from MODIS infrared retrievals. This effort includes radiative transfer modeling, comparison of *in situ* and satellite observations, development and evaluation of processing and networking methodologies for algorithm computation and data accession, evaluation of surface validation approaches for IR radiances, and participation in MODIS (project) related activities. Efforts this quarter have focused on radiative transfer modeling and evaluation of atmospheric path radiance efforts on SST estimation, exploration of involvement in ongoing field studies, and objective analysis approaches.

A. Near Term Objectives

A.1. Continue interaction with the MODIS Instrument Team through meetings and electronic communications.

A.2 Continue algorithmic development efforts based on experimental match-up databases and radiative transfer models.

A.3 Continue evaluation of different approaches for global SST data assimilation and work on statistically based objective analysis approaches.

A.4 Continue evaluation of high-speed network interconnection technologies.

A.5 Provide investigator and staff support for the preceding items.

B. Overview of Current Progress

B.1 July-September 1994

Activities during the past three months have continued on the previously initiated tasks. Specific emphasis is going on in the areas of radiative transfer modeling, studies to understand the impact of temperature inversions on retrieved surface temperatures and generation of model based retrieval algorithms; continuing discussions on IR calibration/validation as part of the MODIS Ocean Science Team cruise effort; and work on implementation of a design and implementation for a wide area network based on ATM technology. Previously initiated activities, such as additional definition of the ATBD data flows and other team related activities, are ongoing.

B.1.1 Radiative Transfer Modeling

Evaluation of LOWTRAN (Selby *et al*., 1978) and Rutherford Appleton Laboratory (RAL) radiative transfer models was completed (Llewellyn-Jones *et al*., 1984). We have selected the RAL line-by-line based code for future work. Recent work has focused on separation of atmospheric path radiance and absorption effects, and the role of emissivity corrections and skin-bulk temperature differences associated with MODIS's SST retrievals.

B.1.2 Algorithm Development Efforts Based on Experimental Match-up Data bases

Work has continued and good progress has been made in terms of evaluating a hierarchy of algorithms for atmospheric correction of the infrared retrievals. A final version of the Evans/NLSST algorithm was selected for processing of the 1988 Pathfinder SST data set. This algorithm gives RMS values of approximately 0.5C based on global monthly composite datasets.

B.1.3 ATBD

There has been continuing work over the past quarter on the ATBD. Efforts have focused on defining an approach to validate surface infrared radiances. We are participating in ongoing discussions with Dr. W. Smith (NOAA/CIMMS) concerning use of an AERI instrument for such efforts and augmentation of currently planned field efforts to provide an end-to-end radiation budget.

B.1.4 Wide Area Networking

Efforts continue to evaluate an experimental wide-area, high speed network between the University of Miami, Oregon State University and the Naval Research Laboratory. ATM switches are installed at each site (through non-EOS funding). PVCs are currently established through the inter-exchange carrier (MCI) between Miami, NRL and OSU with SVCs being established over these connections as appropriate. We are in the process of moving global infrared-based SSTs from Miami to OSU for objective analysis testing. This activity will also

improve the characterization of the network for "distributed-laboratory" efforts, and expedite validation of each of the candidate OA approaches.

C. Investigator Support

July	O. Brown G. Halliwell W. Baringer G. Goni
August	O. Brown A. Mariano W. Baringer G. Goni
September	O. Brown W. Baringer G. Goni A. Kroger

D. Future Activities

D.1 Current:

D.1.1 Algorithms

a. Continue to develop and test algorithms on global retrievals
b. Evaluation of global data assimilation statistics for SST fields
c. Continue RT modeling using RAL approach
d. Evaluation IR surface validation approaches
e. ATBD updates (as needed)
f. Test and utilize ATM based network test bed
g. Continued integration of new 100 Specmark+ workstations into algorithm development environment

D.1.2 Investigator support

Continue current efforts

E. Problems

No new problems to report.

REFERENCES

Llewellyn-Jones, D.T., P.J. Minnett, R. W. Saunders and A.M. Zavody, 1984. Satellite multichannel infrared measurements of sea surface temperature of the N.E. Atlantic Ocean using AVHRR/2. *Quart J.R. Met. Soc*, **110**: 613-631.

Selby, J. E. A., F. X. Kneizys, J. H. Chetwynd Jr., R. A. McClatchey, 1978. Atmospheric Transmittance/Radiance: Computer Code LOWTRAN 4. AFGL-TR-78-0053, Environmental Research Papers, No. 626. Available from NTIS.